

- b<sup>2</sup>. Tibia with 5-6 pairs of spines; lobes of vulva separated posteriorly by a prolongation of the median sclerite; eyes of ocular quadrangle much less strongly recurved, inferior edge of posteriors on a level with centre of anteriors . . . . . Kraussu.

The British Museum has examples of *S. radiatus*, Latr. (= *egyptiacus*, Aud.) from the following localities in Tropical Africa:—E. Africa (*Capt. Speke*); Kinyamholo, Lake Tanganyika (*W. H. Nutt*); Nyika plateau, Nyasaland, 6000-7000 feet (*H. H. Johnston*). We also possess many examples from the following localities:—Cape Verde Islands (*Lieut. Boger* and *F. O. P. Cambridge*); Bushire (*Karachi Mus.*); Bareilly, India (*G. T. P. Cambridge*); Dahanee, Thana District (*A. G. Edie*); and Tharrawaddy (*E. W. Oates*). The specimens from Tharrawaddy were described by Thorell as *S. birmanicus*.

#### MISCELLANEOUS.

*On the Geographical Distribution and the Evolution of Peripatus.*  
(Preliminary Note.) By E.-L. BOUVIER.

THE Onychophora are the terrestrial Articulata which approach most nearly to the Annelids; zoologists are to-day unanimous in considering them as very primitive animals, and, although their remains are unknown in the fossil state, it seems natural to trace back their appearance to a very distant epoch. Distributed in America (Antilles, Central, and a portion of South America), Africa (in the region of the Cape), and in Oceania (from Eastern Australia into New Zealand), they have been considered hitherto as very distinct one from the other according to the area which they occupy; and Mr. Pocock, attributing this fact to their great antiquity, has taken the step of dividing them into three genera, each of which would be peculiar to one of the three geographical zones mentioned above.

The object of this note is to show that this narrow localization does not exist, and that the Onychophora have undergone progressive evolution in the course of the ages, while they receded from their centre of origin.

The specimens which have enabled me to attack this problem were collected in Africa by the lamented M. Thollon, who presented them to the Paris Museum; they belong to a new species, which I propose to call *Peripatus Tholloni*, in memory of the brave and unfortunate explorer by whom it was discovered.

Since this curious species is intermediate between the American forms and those of the Cape, I shall pass successively in review the characters which have rendered it possible, up to the present day, to distinguish the species from the various regions.

(1) *Geographical Distribution*.—*Peripatus Tholloni* comes from the Gaboon, that is to say, from a zone intermediate between the Cape and the parts of America where *Peripatus* is found. These animals had hitherto remained unknown in this region.

(2) *Number of Limbs*.—The American species have many more limbs than the others, generally from 27 to 42 pairs, and, moreover, the number of these appendages varies in different individuals: in the African and Oceanian forms it appears constant for each species; there are from 17 (14?) to 21 pairs in the case of the former and 15 pairs in the latter. In *P. Tholloni* the number of limbs is 24 or 25 pairs.

(3) *Rudimentary Limbs, position of the Sexual Orifice*.—In the American species the genital orifice is situated between the limbs of the penultimate pair, and the limbs of the posterior pair, which are slightly smaller than the rest, have only two arches of spinules instead of four. In the species from the Cape the orifice is sub-terminal and situated far behind the posterior limbs, which are not modified; in the Oceanian forms the orifice is found at a fairly long distance from the anus, between the posterior limbs, which are also normal. In *P. Tholloni* the genital aperture occupies the same place as in the American species, but the last pair of limbs, which is furnished with only two arches, is still more reduced; it is clear that this pair has atrophied in the Oceanian species and that the two posterior pairs have disappeared in *P. capensis*. From this point of view mention must be made of a species from the Cape, *P. Balfouri*, in which the genital orifice, situated near the anus, is found between the greatly reduced posterior limbs, which correspond to the penultimate pair of appendages of *P. Tholloni* and the American species.

(4) *Structure of the Limbs*.—The limbs of the American species are furnished near their extremity with four spinulous arches; in the species from the Cape and from Oceania the proximal arch no longer exists, and only three arches are to be seen. The same applies to *P. Tholloni*. Moreover, in this species, as in the Australian forms, we do not find papillæ at the base of the pedal portion of the limbs, whereas two of these papillæ exist in the case of the species of *Peripatus* from America and the Cape.

(5) *Nephridial Pores of the Fourth and Fifth Limbs*.—On the limbs of the fourth and fifth pairs the nephridial pore is found included between the two proximal spinulous arches in the case of the American species. In *P. Tholloni* it occupies the same place, but, the proximal arch having disappeared, it appears to lie outside the arches, and even makes a slight indentation in the first of these. In the Oceanian species the indentation is much more pronounced, and the nephridial papilla is found to be almost entirely included in the arch; lastly, in the species from the Cape the papilla lies completely in the centre of the latter.

(6) *Wrinkles on the Body*.—In the American species the wrinkles on the body are not interrupted on the dorsal median line and are

composed of a single row of papillæ; in the species from the Cape they exhibit a solution of continuity in the middle of the back and usually comprise several rows of papillæ. *P. Tholloni* has continuous wrinkles like those of the American species, but it exhibits in each wrinkle one or two rows of little accessory papillæ.

(7) *Jaws*.—In the American species the two blades of each jaw are provided with an accessory tooth on the inner margin of the principal tooth; moreover, the inner maxillary blade is armed with a long row of denticles. In the species from the Cape the accessory tooth disappears on the inner blade, and the denticles of this blade are much less numerous; the same applies to the Oceanian forms, but here the accessory tooth disappears on the outer blade also. In *P. Tholloni* the jaws are of the same type as those of the American species.

It results from the foregoing that *P. Tholloni* constitutes the transition between the American species of *Peripatus* and those of South Africa. More closely related to the former, it must be regarded as having originated from the American species of *Peripatus*, which gradually spread towards the East at an epoch at which a continental barrier still united the New World to the Old. In proportion as this eastward dispersion of *Peripatus* came to pass, the evolution of these animals accentuated itself in a determined direction: the limbs atrophied in succession posteriorly, and, at the same time, their number became more and more constant; the proximal spinulous arches followed, up to a certain point, the same regressive course; the nephridial papillæ of two pairs of limbs advanced by degrees towards the following arch; the wrinkles in the skin became more complicated, then interrupted on the dorsal median line; lastly, the dentiform armature of the jaws underwent successive reduction.

Since, in many respects, the species belonging to Oceania mark the present limit of the evolution of the Onychophora, it would be possible to believe that the species of *Peripatus* of this region are derived from African species which had emigrated eastwards in geological times. But since certain characters of these animals are somewhat primitive (position of the sexual orifice and of the nephridial pores of the fourth and fifth limbs), we may also suppose that the dispersal of the group took place in both directions at the same time—towards the east in the case of Africa and towards the west as regards Australia and the adjacent regions. The study of the Chilian *Peripatus* will perhaps enable us to solve this problem.

In any case, it appears to be quite certain that Central America and the Caribbean Region have been the centre of origin and migration of the species of *Peripatus*; their dispersion towards the East is likewise scarcely open to doubt, and we must expect to discover them in all the tropical portions of West Africa, at least as far as the region of the Cape Verd Islands.—*Comptes Rendus*, t. cxxvi. No. 19 (May 9, 1898), pp. 1358–1361.

New Observations on *Peripatus*.

By E.-L. BOUVIER.

The object of the Note which I recently published in the 'Comptes Rendus de l'Académie des Sciences' \* was to show that *Peripatus* is probably of American origin and that transitional forms exist between the species belonging to the New World and those that occur in the Old; to-day my purpose is to make known a new *Peripatus*, the peculiar interest of which is that it clearly demonstrates the characteristics of the most primitive representatives of the genus.

This *Peripatus* belongs, like *P. Tholloni*, to the collection of the Paris Museum; it was obtained at Popayan, in New Granada (Colombia), by a traveller whose name has escaped us. Captured in a house, it had ejected a copious fluid from its posterior tentacles, and was found to be partially enclosed in this secretion, which had been coagulated by the alcohol in which the specimen was preserved.

Difficult as it is to separate one from another in the case of the majority of the American species, the present form possesses some eminently characteristic features.

In the general form of the body the animal somewhat resembles *Peripatus Moseleyi*: it presents a great and regular expansion from the extremities to the middle, at which point its diameter amounts to 8.8 millim.; its total length, excluding the tentacles, is 73 millim.

The transverse wrinkles in the integument are not interrupted on the dorsal median line, which is depressed, but they become perceptibly attenuated there; on the back they are adorned with little conical and transversely elongated papillæ, which form several irregular rows in each furrow; here and there these rows are interrupted by very large conical or subcylindrical papillæ, which occupy the entire width of the furrow. These large papillæ are few in number and resemble warts scattered about on the integument of the animal; more abundant and slightly reduced in size in the neighbourhood of the limbs, they are entirely wanting on the ventral surface and on the appendages, and are replaced in these regions by papillæ similar to those of *Peripatus Edwardsii*.

The antennæ are scarcely dilated in front and exhibit about forty-seven rings. Including the large internal tooth the number of teeth on each jaw is four: on the inner jaw we find, in addition, a row of five or six smaller teeth. No known species exhibits so complicated a dental armature.

The number of pairs of limbs is thirty-seven; we know that there are as many as thirty-six in *Peripatus quitensis*, Schmarda, and more than forty in *P. torquatus*, Kennel. They are very much flattened in the antero-posterior direction, almost laminiform, and, although this appearance may be partly due to the action of the alcohol, it is certain that the living animal must attract attention

\* *Vide suprâ*, p. 351.

owing to the flattened and, up to a certain point, annelidan form of its appendages. Moreover, this is not the only interesting peculiarity exhibited by the latter. Their horseshoe-shaped spinulous arches are five in number, and sometimes there may even be observed the indications of a sixth arch; the limbs belonging to the penultimate and antepenultimate pairs have only four of these arches, like the normal limbs of the other American species, and those of the last pair, as usual, have no more than two. The portion of the limbs which terminates in the claws is no less well characterized, for it bears at the tip two papillæ in front and two behind, while the other species of *Peripatus* have only one papilla on the posterior portion of their appendages.

The pit with a delicate lining exhibited by the limbs on their ventral surface is at least as well developed as in the other American species; but the nephridial pores on the limbs of the fourth and fifth pairs have a slightly different situation: they occasion a deep notch and even a break of continuity in the intermediate spinulous arch. In reality they occupy the very place where they are found in all the species of *Peripatus*.

The genital orifice is enclosed between the limbs of the penultimate pair, as in the other American species.

The specimen that I have studied belongs to the female sex; it had no embryos in its uteri.

In its very numerous and flattened limbs, the complex armature of its jaws, the four papillæ, and the five spinulous arches of its extremities this species exhibits characters more primitive than those found in any other *Peripatus*, and consequently presents a greater resemblance to the annelidan form whence the group is derived. Since it is besides very easily recognizable owing to the great tuberculiform papillæ which are borne on the dorsal surface, I propose to designate it *Peripatus tuberculatus*.—*Comptes Rendus*, t. cxxvi. No. 21 (May 23, 1898), pp. 1524–1525.

#### *On the Presence of the Common Eel in the Open Sea.*

By LÉON VAILLANT.

In the collections handed over by His Serene Highness Prince Albert of Monaco to the Ichthyological Laboratory of the Muséum d'Histoire naturelle there is a fish which is rendered curious owing to the circumstances under which it was obtained. It was removed by Captain Chaves, Director of the Observatory of Punta Delgada, from the stomach of a Cachalot, and, as we know, these Cetodonts feed upon lower animals, especially Cephalopods, the remains of which are met with in their alimentary canal, to the exclusion, as it seems, of all other prey.

The fish, which is eel-like in shape, is about 90 centimetres in length and of the thickness of a man's arm; its weight may be estimated at 1500 or 2000 grammes; the action of the digestive juices has had but little effect upon it, so that it is possible to determine its characters very precisely. It is an Apod; the osseous

tissue, examined on one side and on the transverse apophysis of a vertebra, exhibits genuine osteoplasts; the vomer is intimately united with the intermaxillæ to form a single mass, and the maxillæ, greatly elongated and armed with fine teeth of uniform size, enter into the composition of the upper jaw—peculiarities which agree very exactly with the characteristics of the suborder to which I assign this fish; moreover, no ventral fins are to be seen; the pectoral fins, which are very distinct, are situated behind a narrow lateral branchial orifice.

For the determination of the genus an important character is to be drawn from the presence of scales, of the form which is habitual in this group when they occur, that is to say of the subepidermic type. Five genera may be quoted as being provided with these organs, namely *Simenchelys*, *Ilyophis*, *Histiobranchus*, *Synaphobranchus*, and *Anguilla*. In the case of the first three the dorsal fin commences very far forwards, above the pectoral fin or very little behind it; in the present specimen it arises 27 centimetres from the snout, that is to say towards the anterior third of the body, at more than twice the length of the head behind the branchial orifice. In *Synaphobranchus* the branchial orifices are united in a common pit on the ventral median line. The individual under examination therefore belongs to the genus *Anguilla*—a conclusion which is also confirmed by the other characters. It must even, without entering into more ample details, be regarded as resembling the Common Eel (*Anguilla anguilla*, Linn.).

This capture, under such circumstances, not only confirms the incontestable fact that the Eel descends to the sea, but also shows that in certain cases after arrival there it advances sufficiently far to become the prey of animals which only live out at sea, like the great Cetaceans. On the other hand, it has been supposed by several ichthyologists that the individuals of unusually large size, exceeding 500 to 800 grammes in weight, which are met with from time to time in ponds, must be regarded as sterile females which have taken up their abode permanently in fresh water; the observation of Captain Chaves would oppose this hypothesis.

In consideration of the obscurity which still surrounds the mode of reproduction of this species, the fact is worthy of attracting attention, for I believe that no analogous case has been mentioned, the presence of Eels in their annual migration having been substantiated hitherto, in salt water, only at the mouth of watercourses and in absolutely littoral regions, never in the open sea. It may be that they then form part of that pelagic fauna, which never appears at the surface and likewise never touches the bottom—a fauna of the existence of which the discoveries already made by His Serene Highness Prince Albert of Monaco, under analogous circumstances\*, enable us to-day to catch a glimpse.—*Comptes Rendus*, t. cxxvi. No. 20 (May 16, 1898), pp. 1429–1430.

\* "Notes sur un Cachalot" (Bull. Muséum Hist. nat. t. i. p. 305, December 24, 1895).